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TITLE: Liquid bleaching agent composition

DATE-ISSUED: October 27, 1998

## INVENTOR-INFORMATION:

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US-CL-CURRENT: 252/186.38; 252/186.28, 252/186.39, 510/312

## CLAIMS:

We claim:

1. A transparent liquid bleaching agent composition comprising hydrogen peroxide (a); a surfactant (b); and a bleach activator (c) capable of yielding an organic peracid when reacted with hydrogen peroxide and having a value of an interaction parameter  $\beta$  of a mixed system consisting of the surfactant (b) and the bleach activator (c) solubilized by surfactant (b), being calculated according to the following equation of smaller than - 2:  $##EQU8##$  wherein C.sub.1 : the critical micelle concentration of the surfactant;

C.sub.2 : the critical micelle concentration of the bleach activator;

$\alpha_{sub}$  : the molar fraction of the surfactant in the whole mixed solute (molar fraction of added surfactant);

$\alpha_{sub.2}$  : the molar fraction of the bleach activator in the whole mixed solute (molar fraction of added activator);

C\*: the critical micelle concentration of the mixed system;

X.sub.1 : the molar fraction of the surfactant in the mixed micelle; and

X.sub.2 : the molar fraction of the bleach activator in the mixed micelle.

2. The liquid bleaching agent composition according to claim 1, which further contains a chelating agent (d).

3. The liquid bleaching agent composition according to claim 1, wherein the surfactant (b) is at least one member selected from the group consisting of nonionic surfactants, anionic surfactants and amphoteric surfactants.

4. The liquid bleaching agent composition according to claim 3, wherein the surfactant (b) comprises a sulfobetaine amphoteric surfactant.

5. The liquid bleaching agent composition according to claim 1, wherein the surfactant (b) is at least one member selected from the group consisting of nonionic surfactants and amphoteric surfactants.

6. The liquid bleaching agent composition according to claim 5, wherein the surfactant (b) comprises a sulfobetaine amphoteric surfactant.

7. The liquid bleaching agent composition according to claim 1, wherein the bleach activator (c) is at least one member selected from the group consisting of compounds represented by the following general formula (I): ##STR22## wherein R represents an alkyl, alkenyl, aryl or alkyl-substituted aryl group which may have an ##STR23## n is 0 or 1, and L represents an eliminable group having an anionic group.

8. The liquid bleaching agent composition according to claim 7, wherein L is selected from the group consisting of ##STR24## --O--R.sup.17 --(O).sub.p --SO.sub.3.sup.- and --O--R.sup.17 --(O).sub.p --SO.sub.3 M wherein R.sup.17 represents an alkylene group having 1 to 5 carbon atoms; p is 0 or 1; and M represents H or an alkali metal.

9. The liquid bleaching agent composition according to claim 7, wherein said bleach activator is represented by the following formula ##STR25## wherein R' represents an alkyl, alkenyl, aryl or alkylsubstituted aryl group having 1 to 20 carbon atoms; and n is 0 or 1.

10. The liquid bleaching agent composition according to claim 7, wherein said bleach activator is capable of yielding an organic peracid having a quaternary ammonium group.

11. The liquid bleaching agent composition according to claim 7, wherein said bleach activator has the formula ##STR26## wherein R.sup.1 represents an alkyl group having 1 to 18 carbon atoms; A represents ##STR27## B represents --(CH.sub.2).sub.n --, --(OCH.sub.2 CH.sub.2).sub.n -- or ##STR28## wherein n is 1 to 12; a and b are either both 0 or both 1; j is 1 or 0;

R.sup.2 and R.sup.3, which may be the same or different from each other, represent an alkyl group having 1 or 2 carbon atoms; linking group is a divalent group; X represents an inorganic or organic counter ion; and L is an eliminating group.

12. The liquid bleaching agent composition according to claim 11, wherein said linking group is a straight-chain or branched alkylene group, a cycloalkylene group, a phenylene group, an alkylene-phenylene group or an oxyalkylene group.

13. The liquid bleaching agent composition according to claim 12, wherein L is selected from the group consisting of ##STR29## --O--R.sup.17 --(O).sub.p --SO.sub.3-- and --O--R.sup.17 --(O).sub.p --SO.sub.3 M wherein R.sup.17 represents an alkylene group having 1 to 5 carbon atoms; p is 0 or 1; and M represents H or an alkali metal.

14. A transparent liquid bleaching agent composition, said composition comprises hydrogen peroxide (a), a surfactant (b) and a bleach activator (c) capable of yielding an organic peracid when reacted with hydrogen peroxide, the content of the hydrogen peroxide (a) is 0.3 to 30% by weight based on the total amount of the composition, the total content of the surfactant (b) and the bleach activator (c) is 0.1 to 50% by weight based on the total amount of the composition, the weight ratio of the surfactant (b) to the bleach activator (c) is 50/1 to 1/5, and the interaction parameter .beta. of a mixed system consisting of the surfactant (b) and the bleach activator (c) solublized by surfactant (b), being calculated according to the following equation is smaller than -2: ##EQU9## wherein C.sub.1 : the critical micelle concentration of the surfactant;

C.sub.2 : the critical micelle concentration of the bleach activator;

.alpha..sub. : the molar fraction of the surfactant in the whole mixed solute (molar fraction of added surfactant);

.alpha..sub.2 : the molar fraction of the bleach activator in the whole mixed solute (molar fraction of added activator);

C\*: the critical micelle concentration of the mixed system;

X.sub.1 : the molar fraction of the surfactant in the mixed micelle; and

X.sub.2 : the molar fraction of the bleach activator in the mixed micelle.

15. The liquid bleaching agent composition according to claim 14, wherein the surfactant (b) is at least one member selected from the group consisting of nonionic surfactants, anionic surfactants and amphoteric surfactants.

16. The liquid bleaching agent composition according to claim 15, wherein the surfactant (b) comprises a sulfobetaine amphoteric surfactant.

17. The liquid bleaching agent composition according to claim 14, wherein the surfactant (b) is at least one member selected from the group consisting of nonionic surfactants and amphoteric surfactants.

18. The liquid bleaching agent composition according to claim 17, wherein the surfactant (b) comprises a sulfobetaine amphoteric surfactant.

19. A transparent liquid bleaching agent composition comprising hydrogen peroxide (a); a surfactant (b); and a bleach activator (c) capable of yielding an organic peracid when reacted with hydrogen peroxide and having .beta. interaction parameter value of a mixed system consisting of the surfactant (b) and the bleach activator (c) solubilized by surfactant (b), being calculated according to the following equation of smaller than -2: ##EQU10## wherein  
C.sub.1 : the critical micelle concentration of the surfactant;

C.sub.2 : the critical micelle concentration of the bleach activator;

.alpha..sub. : the molar fraction of the surfactant in the whole mixed solute (molar fraction of added surfactant);

.alpha..sub.2 : the molar fraction of the bleach activator in the whole mixed solute (molar fraction of added activator);

C\*: the critical micelle concentration of the mixed system;

X.sub.1 : the molar fraction of the surfactant in the mixed micelle; and

X.sub.2 : the molar fraction of the bleach activator in the mixed micelle, said composition having a pH of 6 or less.

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TITLE: Liquid bleaching agent composition

Abstract Text (1):

A transparent liquid bleaching agent composition having a transparent appearance and excellent storage stability and bleaching power, characterized by comprising hydrogen peroxide (a), a surfactant (b) and a bleach activator (c) capable of yielding an organic peracid when reacted with hydrogen peroxide and having a parameter  $\beta$  of a mixed system consisting of the surfactant (b) and the bleach activator (c) as calculated according to the following equation of smaller than -2:  $\#EQU1\#$  wherein  $C_{sub.1}$  : the critical micelle concentration of the surfactant;

Brief Summary Text (7):

Sodium percarbonate and sodium perborate are particularly utilized as the solid oxygen-base bleaching agent from the viewpoint of bleaching performance, stability, etc. A liquid oxygen-base bleaching agent wherein use is made of hydrogen peroxide has also considerably spread by virtue of its handleability.

Brief Summary Text (9):

As a result of the studies conducted by the present inventors, it has been found that compounds capable of reacting with hydrogen peroxide to yield an organic peracid having a quaternary ammonium group, such as those described in U.S. Pat. Nos. 4,933,103 (assignee: Kao Corp., date of grant: Jun. 12, 1990), 5,059,344 (assignee: Kao Corp., date of grant: Oct. 22, 1991), 4,915,863 (assignee: Kao Corp., date of grant: Apr. 10, 1990), 4,978,770 (assignee: Kao Corp., date of grant: Dec. 18, 1990) and the like are very excellent as the bleach activator. Further, examples of an organic peracid precursor having an anionic group are described in U.S. Pat. Nos. 4,412,934 (assignee: Procter & Gamble Co.; date of grant: Nov. 1, 1983), 4,681,592 (assignee: Procter & Gamble Co.; date of grant: Nov. 1, 1987) and the like.

Brief Summary Text (10):

When the bleaching agent composition comprises a mixture of solid substances, a good storage stability can generally be attained when the composition comprises a mixture of a solid peracid salt with the above-described solid bleach activator as a dried particle capable of yielding the above-described organic peracid. Neither any remarkable reaction nor a loss of the activity occurs until the composition is poured into water in a washing machine, etc., so far as they are maintained under dry condition during storage. However, when the composition is exposed to a highly humid environment, for example, in a bathroom, the dry bleaching agent (solid peracid salt) becomes humid, whereby its activity is lowered. When hydrogen peroxide which is liquid at an ordinary temperature is used as a peroxide source, it is impossible to provide a bleaching agent composition in a dried particle form.

Brief Summary Text (11):

Several proposals have been made on a liquid bleaching agent composition comprising hydrogen peroxide. U.S. Pat. No. 3,970,575 (assignee: Purex, date of grant: Jul. 20, 1976) discloses a bleaching agent composition comprising hydrogen peroxide which is stable under an acidic condition and is colored blue with a phthalocyanine pigment. U.S. Pat. No. 3,956,159 (assignee: Procter & Gamble Co.; date of grant: May 11, 1976) discloses a liquid bleaching agent composition comprising an organic peracid and its salt dissolved in an anhydrous organic ternary solvent (a three-component solvent). Further, U.S. Pat. No. 4,238,192 (assignee: Johnson & Johnson; date of

grant: Dec. 9, 1980) discloses a liquid bleaching agent composition based on hydrogen peroxide. This composition contains an acid for adjusting the pH value thereof to 1.8 to 5.5 and a nitrogen compound (particularly an amino acid) for imparting a stability thereto. U.S. Pat. No. 4,130,501 (assignee: F.M.C. Corp.; date of grant: Dec. 19, 1978) discloses a stable, viscous, liquid bleaching agent composition comprising hydrogen peroxide which contains a surfactant and a thickener being added thereto. Besides these compositions, a detergent composition comprising an alkylphenolic nonionic surfactant, hydrogen peroxide and a stabilizer (phosphoric acid or the like), and an aqueous concentrate for bleaching having an excellent storage stability and a pH value of 10 or less and containing hydrogen peroxide, a nonionic Tenside and a specified amine oxide as a stabilizer are also known in the art. All of these inventions, however, are ones made for the purpose of stabilizing a liquid bleaching agent composition comprising hydrogen peroxide, and no consideration is given to an improvement in the bleaching power. Further, since no bleach activator is incorporated in all of them, the bleaching power cannot be said to be satisfactory.

Brief Summary Text (12):

Meanwhile, a liquid bleaching agent composition which utilizes a bleach activator capable of yielding an organic peracid is also known in the art. For example, U.S. Pat. No. 4,772,290 (assignee: Clorox, date of patent: Sep. 20, 1988) discloses a composition having an excellent storage stability and a low temperature activity and comprising an acidic aqueous solution containing hydrogen peroxide and a solid bleach activator dispersed therein. Since, however, this composition is not transparent and a bleach activator is dispersed therein, it has a drawback that the activator precipitates and separates during storage, so that the object of the use of the composition is remarkably spoiled. Further, this composition also has a drawback that no satisfactory bleaching power can be attained during use because the bleach activator is stored in an aqueous solution and therefore it gradually undergoes hydrolysis. Thus there has not been found any liquid bleaching agent composition which is transparent and excellent in storage stability and contains, dissolved therein, a bleach activator capable of yielding an organic peracid.

Brief Summary Text (15):

The present inventors have made extensive studies with a view to developing a liquid oxygen-base bleaching agent composition which is excellent in storage stability and transparent and has a higher bleaching power. As a result, they have found that the .beta. value as an index for the magnitude of interaction between a surfactant and a bleach activator correlates to the storage stability. They have further studied from this point of view and, as a result, have found that when a bleach activator is combined with a surfactant in such a manner that the .beta. value is smaller than -2, the bleach activator can be stabilized and homogeneously dissolved in a transparent state, so that it becomes possible to provide a transparent liquid oxygen-base bleaching agent composition wherein a bleach activator is in a remarkably stabilized state even in an aqueous hydrogen peroxide solution, which has led to the completion of the present invention.

Brief Summary Text (16):

Accordingly, the present invention provides a transparent liquid bleaching agent composition, characterized by comprising hydrogen peroxide (a), a surfactant (b) and a bleach activator (c) capable of yielding an organic peracid when reacted with hydrogen peroxide, and having a value of an interaction parameter, .beta., of a mixed system consisting of the surfactant (b) and the bleach activator (c) as calculated according to the following equation of smaller than -2: ##EQU2## wherein C.sub.1 : the critical micelle concentration of the surfactant;

Brief Summary Text (24):

In the present invention, hydrogen peroxide (a) is incorporated in an amount of 0.3 to 30% by weight, preferably 0.5 to 10% by weight, particularly preferably 2 to 7% by weight, into the composition.

Brief Summary Text (53):

The bleach activator (c) to be used in the present invention, which yields an organic peracid when reacted with hydrogen peroxide, is not particularly limited so far as it can be solubilized by a surfactant used for the preparation of the liquid

bleaching agent composition of the present invention, and examples thereof include triacetin, a fatty acid anhydride having 2 to 18 carbon atoms, and sodium alkanoyloxybenzenesulfonate.

Brief Summary Text (64):

In the present invention, the surfactant (b) and the bleach activator (c), which yields an organic peracid when reacted with hydrogen peroxide, are incorporated in a total amount ((b) plus (c)) of 0.1 to 50% by weight, preferably 6 to 45% by weight, particularly preferably 8 to 25% by weight, into the liquid bleaching agent composition. The weight ratio of the component (b) to the component (c) is 50/1 to 1/5, preferably 15/1 to 1/1, particularly preferably 10/1 to 3/1.

Brief Summary Text (65):

Further, in the present invention, the surfactant (b) and the bleach activator (c), which yields an organic peracid when reacted with hydrogen peroxide, are selected in such a manner that the value of the interaction parameter  $\beta$  of a mixed system consisting of the surfactant (b) and the bleach activator (c) as calculated according to the following equation is smaller than -2, preferably -30 to -3, particularly preferably -20 to -4:  $\beta = \frac{C_{sub.1}}{C_{sub.2}}$  wherein  $C_{sub.1}$  : the critical micelle concentration of the surfactant;

Brief Summary Text (72):

When the bleach activator (c) and the surfactant (b) are selected in such a combination that the  $\beta$  value is smaller than -2, it becomes possible to produce a transparent liquid oxygen-base bleaching composition wherein the bleach activator (c) is in a very stabilized state in the aqueous hydrogen peroxide solution.

Brief Summary Text (87):

The present inventors have studied on the relationship between the interaction parameter  $\beta$  and the stability of the liquid bleaching agent composition with respect to a system where various surfactants and bleach agents are present together and, as a result, have found that a transparent liquid oxygen-base bleaching agent composition, wherein a bleach activator is in a very stable state in an aqueous hydrogen peroxide solution, can be produced only when a combination of the bleach activator with the surfactant is selected in such a manner that the  $\beta$  value is smaller than -2.

Brief Summary Text (88):

Specifically, in the bleaching agent composition of the present invention, the solubilization of the bleach activator in a micelle of the surfactant serves to prevent the occurrence of a reaction of the bleach activator with a bulk solution and contributes to the stabilization of the bleach activator. Examples of the system wherein the bleach activator can be more stabilized include a system wherein the rate of exchange of the bleach activator in the micelle with one in a monodisperse state in the bulk solution is lower, a system wherein the probability of the presence of the bleach activator in the micelle is higher, and a system wherein the bleach activator is less liable to react with hydrogen peroxide in the bulk. Specifically, it is conceivable that the bleaching agent composition has a good storage stability in a system wherein the bleach activator difficultly migrates from the mixed micelle to the bulk. It is conceivable that when the bleaching agent composition is diluted during washing or bleaching, the mixed micelle is broken, thus inducing an intended reaction for yielding an organic peracid.

Brief Summary Text (100):

In the liquid bleaching agent composition of the present invention, since the bleach activator and the surfactant are used in such a combination as will provide a specified interaction parameter  $\beta$  value, the formation of a mixed micelle comprising the two components serves to stabilize the bleach activator. The bleach activator is dissolved in a homogeneous and transparent state in an aqueous solution of hydrogen peroxide by the formation of the above-described mixed micelle. This provides a transparent liquid oxygen-base bleaching agent composition wherein a bleach activator is in a very stabilized state in an aqueous solution of hydrogen peroxide.

CLAIMS:

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.alpha..sub.2 : the molar fraction of the bleach activator in the whole mixed solute
(molar fraction of added activator);
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C\*: the critical micelle concentration of the mixed system;

X.sub.1 : the molar fraction of the surfactant in the mixed micelle; and

X.sub.2 : the molar fraction of the bleach activator in the mixed micelle, said composition having a pH of 6 or less.